

WHAT IS CLAIMED IS:

1 1. An isolated nucleic acid comprising a polynucleotide sequence, or
2 complement thereof, encoding a polypeptide comprising
3 an amino acid sequence at least 40% identical to DMT Domain A; or
4 an amino acid sequence at least 40% identical to DMT Domain B; or
5 an amino acid sequence at least 40% identical to DMT Domain C; or
6 a combination thereof.

1 2. The isolated nucleic acid of claim 1, wherein the polypeptide is at
2 least 70% identical to SEQ ID NO:2.

1 3. The isolated nucleic acid of claim 1, wherein the polypeptide is
2 SEQ ID NO:2.

1 4. The nucleic acid of claim 1, wherein the polypeptide comprises an
2 amino acid sequence identical to a domain of claim 1.

1 5. The nucleic acid of claim 1, wherein the polypeptide is capable of
2 exhibiting at least one of the following biological activities:

- 3 (a) glycosylase activity;
- 4 (b) demethylation of polynucleotides;
- 5 (c) DNA repair;
- 6 (d) wherein expression of the polypeptide in a plant modulates organ
7 identity;
- 8 (e) wherein expression of the polypeptide in a plant modulates organ
9 number;
- 10 (f) wherein expression of the polypeptide in a plant modulate
11 meristem stem and/or activity;
- 12 (g) wherein enhanced expression of the polypeptide in a plant results
13 in a delay in flowering time;
- 14 (h) wherein introduction of the polypeptide into a cell results in
15 modulation of methylation of chromosomal DNA in the cell;
- 16 (i) wherein reduction of expression of the polypeptide in a plant
17 results in modulation of endosperm development;

- 18 (j) wherein expression of the polypeptide in an *Arabidopsis* leaf
19 results in modulation of expression of the *MEDEA* gene.
- 1 6. The nucleic acid of claim 5, wherein the polypeptide comprises
2 either a
3 (i) basic region;
4 (ii) nuclear localization signal;
5 (iii) leucine zipper;
6 (iv) helix-hairpin-helix structure;
7 (v) glycine-proline rich loop with a terminal aspartic acid or
8 (vi) helix that is capable of binding DNA.
- 1 7. The isolated nucleic acid of claim 1, wherein the nucleic acid
2 further comprises a promoter operably linked to the polynucleotide.
- 1 8. The isolated nucleic acid of claim 7, wherein the promoter is a
2 constitutive promoter.
- 1 9. The isolated nucleic acid of claim 7, wherein the promoter is from
2 a DMT gene.
- 1 10. The isolated nucleic acid of claim 9, wherein the promoter
2 comprises a polynucleotide at least 70% identical to a sequence selected from the group
3 consisting of SEQ ID NO:3, SEQ ID NO4 and SEQ ID NO:6.
- 1 11. The isolated nucleic acid of claim 10, wherein the promoter is
2 selected from the group consisting of SEQ ID NO:3, SEQ ID NO4 and SEQ ID NO:6.
- 1 12. The isolated nucleic acid of claim 7, wherein the polynucleotide
2 sequence is linked to the promoter in an antisense orientation.
- 1 13. An expression cassette comprising a promoter operably linked to a
2 heterologous polynucleotide sequence, or a complement thereof, encoding the
3 polypeptide of claim 1.
- 1 14. The expression cassette of claim 13, wherein the polynucleotide
2 sequence is linked to the promoter in an antisense orientation.

- 1 15. A host cell comprising an exogenous polynucleotide sequence
2 comprising a polynucleotide sequence, or complement thereof, encoding the polypeptide
3 of claim 1.
- 1 16. The host cell of claim 15, wherein the nucleic acid further
2 comprises a promoter operably linked to the polynucleotide sequence.
- 1 17. The host cell of claim 16, wherein the host cell is a plant cell.
- 1 18. A method of modulating transcription, the method comprising,
2 (a) introducing into a host cell an expression cassette of claim 13; and
3 (b) selecting a host cell with modulated transcription.
- 1 19. The method of claim 18, wherein the expression cassette is
2 introduced by *Agrobacterium*.
- 1 20. The method of claim 18, wherein the expression cassette is
2 introduced by a sexual cross.
- 1 21. The method of claim 18, wherein the polypeptide is capable of
2 exhibiting at least one of the following biological activities:
3 (a) wherein enhanced expression of the polypeptide in a plant results
4 in a delay in flowering time;
5 (b) wherein introduction of the polypeptide into a cell results in
6 modulation of methylation of chromosomal DNA in the cell;
7 (c) wherein reduction of expression of the polypeptide in a plant
8 results in enhanced endosperm development;
9 (d) wherein expression of the polypeptide in an *Arabidopsis* leaf
10 results in expression of the *MEDEA* gene.
- 1 22. The method of claim 18, wherein the promoter is operably linked
2 to the heterologous polynucleotide in the antisense orientation.
- 1 23. A method of detecting a nucleic acid in a sample, comprising
2 (a) providing an isolated nucleic acid molecule according to claim 1,

3 (b) contacting the isolated nucleic acid molecule with a sample under
4 conditions which permit a comparison of the sequence of the isolated nucleic acid
5 molecule with the sequence of DNA in the sample; and

6 (c) analyzing the result of the comparison.

1 24. A transgenic plant cell or transgenic plant comprising a
2 polynucleotide sequence, or complement thereof, encoding a polypeptide of claim 1.

1 25. A plant which has been regenerated from a plant cell according to
2 24.

1 26. The plant of claim 25, wherein the polypeptide is capable of
2 exhibiting at least one of the following biological activities:

3 (a) wherein enhanced expression of the polypeptide in a plant results
4 in a delay in flowering time;

5 (b) wherein introduction of the polypeptide into a cell results in
6 modulation of methylation of chromosomal DNA in the cell;

7 (c) wherein reduction of expression of the polypeptide in a plant
8 results in enhanced endosperm development;

9 (d) wherein expression of the polypeptide in an *Arabidopsis* leaf
10 results in expression of the *MEDEA* gene.

1 27. An expression cassette for the expression of a heterologous
2 polynucleotide in a plant cell, wherein
3 the expression cassette comprises a promoter at least 70% identical to a
4 sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:4 and SEQ ID
5 NO:6, and

6 the promoter is operably linked to a heterologous polynucleotide.

1 28. The expression cassette of claim 27, wherein the promoter is
2 selected from the group consisting of SEQ ID NO:3, SEQ ID NO:4 and SEQ ID NO:6.

1 29. The expression cassette of claim 27, wherein the promoter
2 specifically directs expression of the heterologous polynucleotide in a female
3 gametophyte when the expression cassette is introduced into a plant.